User manual

Wireline WL56/42

Doc. no.: WL56/42e.06

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1. Introduction

The Sandvik Wireline System (WL) is available in dimensions of 46, 56, 66 and 76 mm. There are two different versions of WL56, where the differences are primarily the weight of the drill rod and the inner dimension, which permit different core dimensions. The 66 and 76 mm dimensions include a triple variant with an extra inner tube.

Table 1: Different Wireline Systems

System	Hole dimension	Core dimension	Tube ext./ int. dim.	Tube weight kg/m
WL46	Ø47.0	Ø28.8	Ø43.2/35.2	3.9
WL56/39	Ø56.8	Ø39	Ø53.2/45.2	4.9
WL56/42	Ø56.8	Ø41.2	Ø53.2/47.2	3.8
WL66	Ø67.1	Ø50.5	Ø63.9/57.0	5.1
WL66-3	Ø67.1	Ø45	Ø63.9/57.0	5.1
WL76	Ø76.3	Ø57.5	Ø73.2/64.4	7.5
WL76-3	Ø76.3	Ø51	Ø73.2/64.4	7.5
WL103	Ø102.8	Ø80	Ø98/88.8	10.6

1.1 Description

WL56/42 is a thinwall Wireline System adapted to the metric system. This makes it possible to switch between the T, TT and WL Systems whenever necessary.

The WL System is intended to be used for drilling in all directions without the need for extra accessories. An overshot is used to obtain the best results from the system, which is designed to be pumped into the hole (see chapters “Overshot for Pumping In” on page 20 and “Stuffing Box” on page 22). This overshot can be used in all directions, even with a high water pressure.

For recovery in drill holes inclined at an angle of more than 60° from the horizontal plane there is a free falling overshot (see chapter “Free Falling Overshot” on page 16), which is provided with wheels. The same overshot can be fitted with a special lowering device for use in downward holes with water loss, so-called dry holes.

The WL core barrels are available in lengths of 1.5 and 3.0 m, but can be extended to 4.5 and 6.0 m, please contact Sandvik for further information.

Drill bits for WL56 are manufactured as standard with an external diameter of 56.5 and reaming shell of 56.8 mm.

Remark

When drilling with an oversize bit and reaming shell an oversized drill rod connection should be used.

2. Safety Instructions

WARNING

When handling Wireline it is important to inspect the wire visually, since a broken wire can cause injury to personnel or damage the equipment. When the wire starts to look damaged it should be shortened.

WARNING

There is a risk of injury from the wire during Wireline drilling. This risk is greatest between the Wireline windlass and the top of the mast. Do NOT enter this area when the wire is in operation. There is also a risk of getting trapped round the drum, in the wire spreader on the drum, and at the pulley on the mast. Remember that the wire can split up, which can lead to severe cut injuries. Never grip the wire when it is in motion.

WARNING

When handling Wireline the inner tube can release on detachment and come sliding out of the hole at high speed.

WARNING

When the core barrel is emptied from the drill bit there is a risk of injuring the hands and fingers. The core can come sliding out from the core barrel at high speed. NEVER place the hands and fingers under the core barrel, place them is such a way that the core can pass without causing injury.

WARNING

The drill rods are exposed to a higher load and heavier vibrations during upward drilling. The risk of drill rods braking when they are worn is therefore increased. If the rods break during the drilling the rod holder will be open, which causes the rod string to slide out from the hole. For this reason, place the panel at a safe distance from the barrier.

WARNING

The risk of injury increases more than normal during upward drilling.

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WARNING

Cuff wrenches must under NO CIRCUMSTANCES be used on the rods when they are rotated by means of the machine. They can come loose and injure the operator, or cause pinch injuries on the hands and fingers.

WARNING

Remember to secure the machine in a reliable manner when it is anchored to the rock. Make sure to inspect the attachment during operation to make sure the machine does not come loose.

WARNING

Remember that you should have the opportunity to reach, or have regular contact with those around you if you should become injured when using the machine.

2.1 Recommendations

- Check the threads on the drill rods regularly. If the threads are damaged they can damage other rods they are attached to. Pay extra attention to the water swivel tube.
- Make sure that the threads are properly engaged with each other before the rods are screwed together by means of the machine.
- Make sure that the rod does not break during threading (rod support and guides).
- Make sure to lubricate the threads.

Note

Always lubricate the drill rod threads with grease that is suitable for high pressure. Special thread lubricant is best.

- Avoid rotating so fast that the threads are “knocked” together.
- Check that the threads are free from dirt and undamaged.
- The continuous feed pressure should not exceed 3.5 tons.
- Avoid too many tough shapening. Use a lower water flow instead for hard rock.
- Make sure that lifting function on the machine functions during the rod threading, and that the “float position” works.
- If the threading on one rod should get damaged during making of joint, both rods should be replaced.

2.2 Wire Handling

2.2.1 Winding of wire

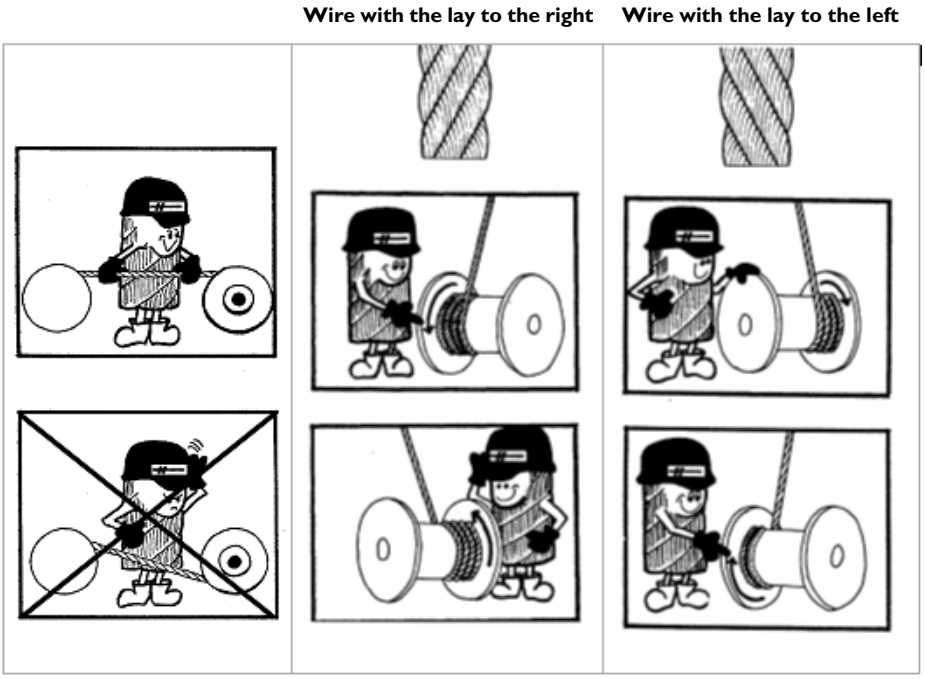
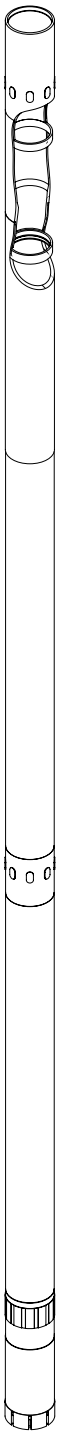


Figure 1. Wire handling

3. Outer Core Barrel, complete

The core barrel drill rod adaptor (1) has tungsten carbide inserts so that it can be guided up and therefore minimize the hole deviation. The core barrel can be fitted with a top reamer (part no. 101 220 542) and guides in the middle.

3.1 Fitting of Outer Core Barrel



The outer landing ring (LY) (4) is fitted in the adapter tube's (5) female thread, with the internal collar facing upwards.

The latch housing (3) locks the landing ring (4).

Remark

The landing ring should be replaced after drilling approx. 500 m.

The latching ring (2) is fitted on the latch housing's (3) female thread.

The drill rod adaptor (1) locks the latching ring.

The latching ring can be reversed after a period of use if the edge has become worn.

When extending the core barrel an outer tube coupling (6) or a reaming shell (9) is fitted between the outer tubes.

The outer tubes are of standard lengths 1.5 m or 3.0 m (see table "Extendable Outer Core Barrel WL56/42" on page 9).

On those occasions when the outer tube is taken up for inspection a careful check should be made that the outer landing ring and latching ring are in place and undamaged.

The inner tube is locked upwards in the outer tube in that the core barrel head latches support the latching ring. The inner tube is fixed downwards in that the outer landing ring has a smaller diameter than the core barrel head's landing ring.

The tensile force when breaking the core is transferred from the core lifter case to the drill bit in that the inner tube connection is flexible in the axial plane (the core lifter case "rests" on the bit). The play between drill bit and core lifter case can be adjusted for different types of drilling.

Before recovery the core is broken and the core barrel lifted 3-6 m. This prevents drill cuttings that drop back into the hole collecting inside the outer tube.

Freshing the inner tube to mismatch when sent back.

3.2 List of spare parts – Outer Core Barrel

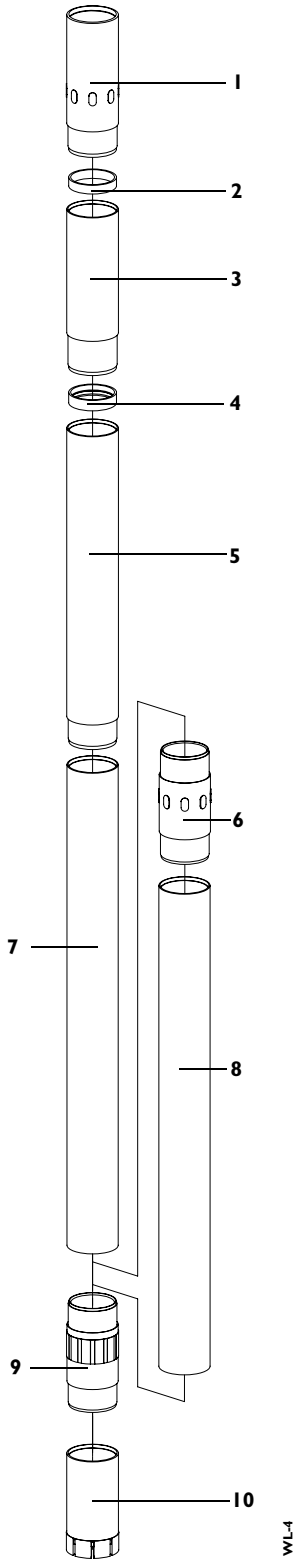


Table 2: List of spare parts, Outer Core Barrel

No.	Quantity	Part	Remarks	Part no.
1	1	Drill rod adaptor, right-hand		601 222 700
1.1	1	Drill rod adaptor, right-hand	TH thread	601 222 857
2	1	Latching ring		601 222 701
3	1	Latch housing		601 222 702
4	1	Outer landing ring		601 222 703
5	1	Adaptor tube	L = 331 mm	601 222 711
6	1	Outer tube coupling		601 222 706
7	*	Outer tube, 1.5 m	L = 1 552 mm	601 222 704
7.1	*	Outer tube, 3.0 m	L = 3 052 mm	601 222 705
8	*	Extension tube, outer tube, 1.5 m	L = 1 552 mm	601 222 704
8.1	*	Extension tube, outer tube, 3.0 m	L = 3 052 mm	601 222 705
9	1	Reaming shell		
10	1	Drill bit		

* Standard outer tube (7) also used as extension tube (8).

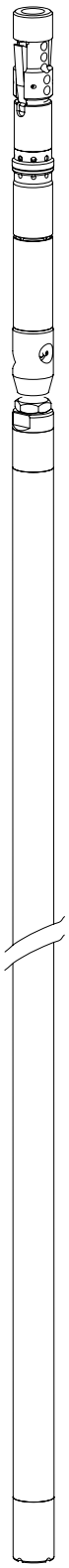
Table 3: Extendable Outer Core Barrel WL56/42

Length (m)	Quantity	Outer tube standard	Quantity	Extension tube outer tube	Part no. compl. tube
1.5	1	601 222 704	-	-	601 222 738
3.0	1	601 222 705	-	-	601 222 739
4.5/2	1	601 222 705	1	601 222 704	601 222 740
6.0/2	1	601 222 705	1	601 222 705	601 222 741

Table 4: Outer Core Barrel with TH thread connection

Length (m)	Quantity	Outer tube standard	Quantity	Extension tube outer tube	Part no. compl. tube
1.5	1	601 222 704	-	-	601 222 858
3.0	1	601 222 705	-	-	601 222 859
4.5/2	1	601 222 705	1	601 222 704	601 222 860
6.0/2	1	601 222 705	1	601 222 705	601 222 861

4. Inner Core Barrel, complete



A standard inner tube is used to extend the inner tube (see table “Extendable Inner Core Barrel WL56/42” on page 11).

Always use cuff wrenches when working with the inner tube (2) and core lifter case (5). Check the function of the core lifter spring (4) after each recovery. If the inner tube is clamped oval, or otherwise damaged, the inner tube can stick in the drill rod or outer landing ring. A landing ring for the core barrel head can be used to check that the inner tube has not been deformed.

Table 5: Estimated times for pumping in Inner Core Barrel

System	Volume drill rod	Speed with water flow of 40 l/min.	Time to 100 m with water flow of 40 l/min.
WL46/29	1.0 l/m	40 m/min.	2.5 min.
WL56/39	1.6 l/m	25 m/min.	4 min.
WL56/42	1.7 l/m	24 m/min.	4 min.
WL66/45	2.6 l/m	16 m/min.	6 min.
WL66/50.5			
WL76/51	3.3 l/m	12 m/min.	8 min.
WL76/57.5			

The pumping in time for the inner core barrel is part of the total handling time. If the Sandvik System with pumping of the inner tube or lifter is used it is possible to obtain an indication of when they are in position. This ensures significant time savings since the drilling or recovery of the inner core barrel can be started immediately. How long the pumping takes depends on how much water can flow in the gap between the core barrel and hole wall. This time can be reduced by increasing the pressure of the water, or increasing the gap between the drill rod and hole wall. If the gap is increased between the drill rod and hole this increases the risk of deviated holes.

4.1 List of spare parts – Inner Core Barrel, complete

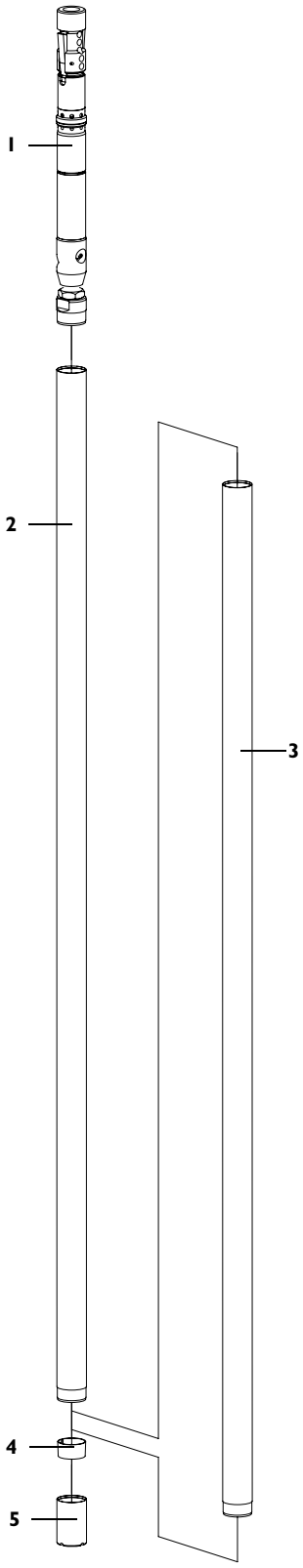


Table 6: List of spare parts, Inner Core Barrel, complete

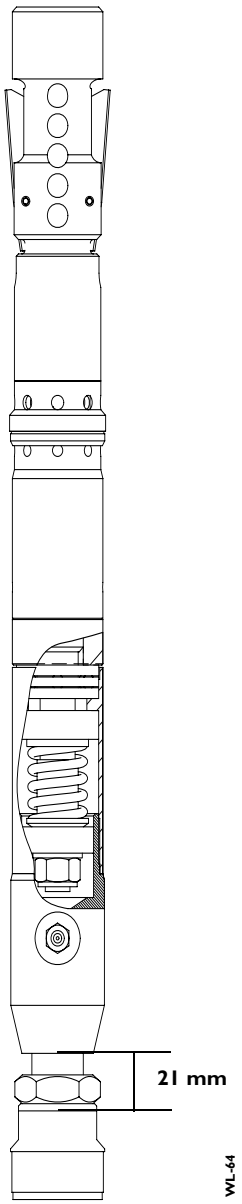
No.	Quantity	Part	Remarks	Part no.
1	1	Core barrel head		601 222 714
2	*	Inner tube 1.5 m	L = 1 637 mm	601 222 707
2.1	*	Inner tube 3.0 m	L = 3 137 mm	601 222 708
3	*	Extension tube, inner tube 1.5 m	L = 1 637 mm	601 222 707
3.1	*	Extension tube, inner tube 3.0 m	L = 3 137 mm	601 222 708
4	1	Core lifter spring, standard		601 222 709
5	1	Core lifter case		601 222 710

* Standard inner tube (2) can also be used as extension tube (3).

Table 7: Extendable Inner Core Barrel WL56/42

Length (m)	Quantity	Inner tube standard	Quantity	Extension tube inner tube	Part no. compl. tube
1.5	1	601 222 707	-	-	601 222 742
3.0	1	601 222 708	-	-	601 222 743
4.5	1	601 222 708	1	601 222 707	601 222 744
6.0	1	601 222 708	1	601 222 708	601 222 745

5. Core Barrel Head



Core barrel head has part no. 601 222 714.

Core barrel head with shut off valve has part no. 601 222 714-1.

Check that the latches (2) move freely and that the O-ring (1) and tubular pin (3) are undamaged.

When checking the latches the lifter tip is inserted in the core barrel head. The back edge of the lifters should then be inside the outer dimension of the latch housing. If not, the tubular pin is probably crooked or the hole in the latch worn.

When fitting the release valve (8) the spring (9) must be turned with the rivet from the release valve.

Note

Make sure that the cylindrical pin (10) does not catch in the thread and can easily be moved in its slot.

Note

Lubricate the core barrel head with grease every time it is taken up.

Use enough grease to ensure that fresh grease is pressed out through the bearing housing (13). Oil in the release valve through the hole at the landing ring (6). Wipe off all surplus grease.

If the release valve jams there is a reamer (part no. 300 025 325) to clean the release valve seat.

The landing ring core barrel head is fitted so that the hole is turned backwards on the valve housing (11). Fit the latch housing (4) [with spacer washer (5)] on the valve housing, and tighten. Screw the landing ring core barrel head to the latch housing, and tighten. It will now function as a lock nut.

When fitting the bearing unit it should be noted that the thrust ball bearing (12) must be turned correctly for the grease to pass through the bearing.

Note

The thrust ball bearing (12) washers have different hole diameters. The washer with the smallest hole diameter is fitted upwards.

To optimize drilling in different types of rock it may be necessary to adjust the gap between the bit and core lifter case. This is done be releasing the lock nut on the inner tube connection (25) and adjusting the gap between the inner tube connection (25) and the lower bearing housing (23).

The recommended setting is 21 mm.

5.1 List of spare parts – Core Barrel Head 601 222 714, – Core Barrel Head with shut off valve 601 222 714-1

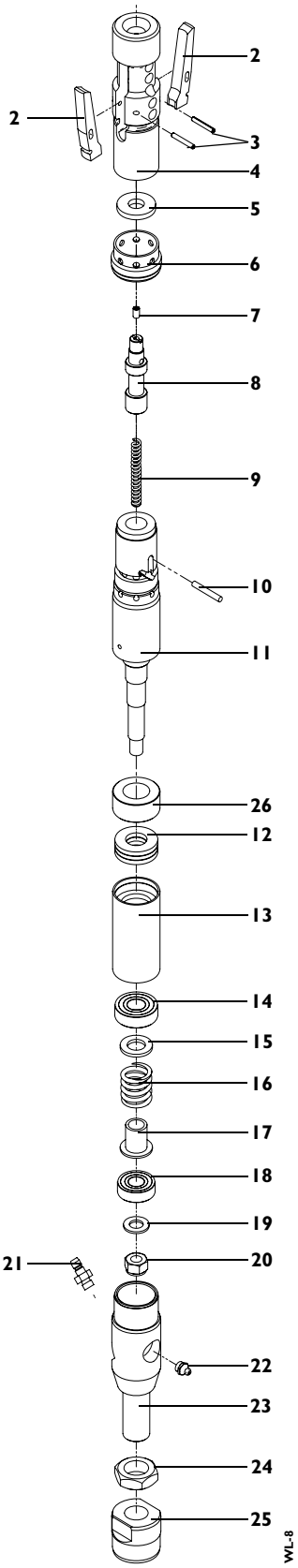


Table 8: List of spare parts, Core Barrel Head

No.	Quantity	Part	Remarks	Part no.
1	1	O-ring	29.2 x 3.0	300 012 687
2	2	Latch		601 222 310
3	2	Tubular pin	4.0 x 28	300 015 966
4	1	Latch housing		601 222 319
5	1	Spacer		601 222 312
6	1	Landing ring core barrel head		601 222 715
7	1	Stop screw		300 012 531
8	1	Release valve		601 222 344
9	1	Spring		601 222 378
10	1	Cylindrical pin		300 022 671
11	1	Valve housing		601 222 466
12	1	Thrust ball bearing		300 013 549
13	1	Upper bearing housing		601 222 465
14	1	Radial ball bearing		300 013 548
15	1	Washer		300 014 907
16	1	Spring		300 025 064
17	1	Bushing		601 222 313
18	1	Radial ball bearing		300 013 547
19	1	Washer		300 012 553
20	1	Nut		300 014 914
21	1	Quick coupling		300 027 153
22	1	Grease nipple		300 015 242
23	1	Lower bearing housing		601 222 717
24	1	Nut	KM 5	300 013 333
25	1	Inner tube connection		601 222 716
26	*	Spacer		601 222 758
26.1	*	Shut off valve		601 222 756

* A spacer is normally used, but it can be changed to a shut off valve.

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6. Functional description for pumping

In the core barrel head there is a release valve (8), which before pumping in should be locked in a special pumping position. Insert a screwdriver in the latch housing, press the release valve forward and turn a quarter of a turn. The release valve will now be locked in its pumping position and the pumping in of the inner tube can now be started. When the inner tube is in position the water pressure increases powerfully and the flow of water is stopped. This is an indication that the inner tube is in it locked position. With the retention of the high water pressure for a few seconds the release valve will be pressed forward and released from its locked position.

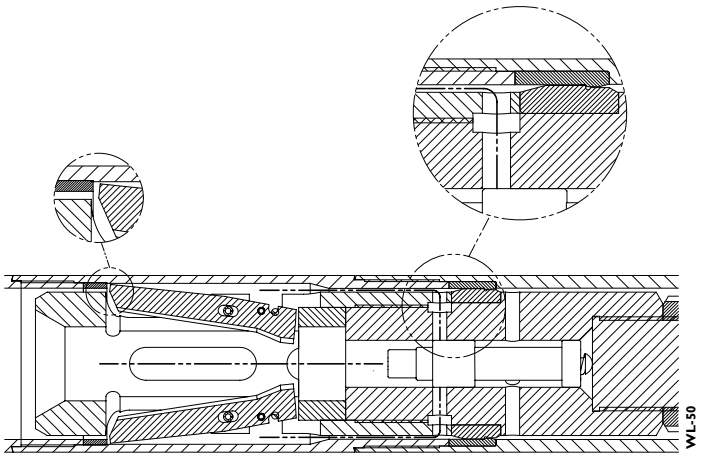


Figure 2. Core barrel head

After the pump flow has been stopped and the water pressure completely drained, the spring will press the release valve upwards. This forms a free passage for the flushing water, and the pumping for the drilling can be started.

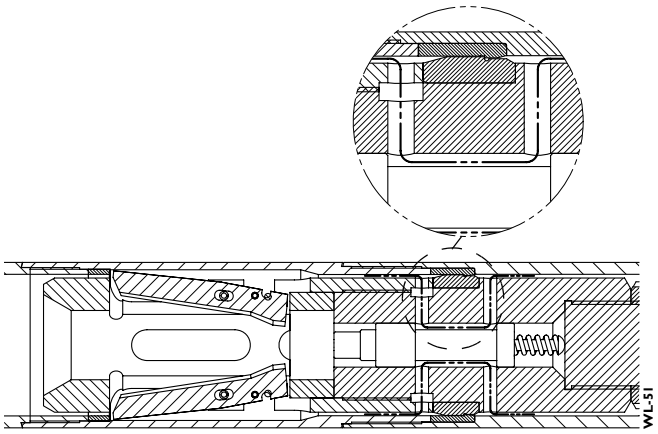
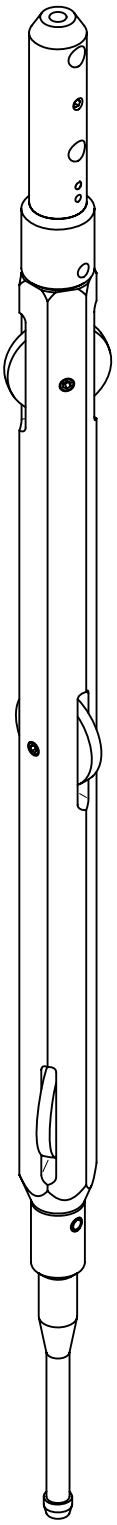


Figure 3. Core barrel head

7. Free Falling Overshot



Free falling overshot has part no. 601 222 731.

The numbers below, in bracket, correspon against the number in the table ““List of spare parts, Free Falling Overshot, WL56/42” on page 17”.

The overshot has a swivel (1, 4, 6) in its upper end, which prevents the wire from twisting. A safety device [shear pin (3)] is built into the swivel and is intended to break at approx. 1.5 tons. This is to eliminate the risk of a cut wire being left in the hole.

Remark

When double shear pins are fitted the breaking point load increases to approx. 3 tons.

The wire is fitted in the wire clamp (1) and locked with three stop screws (2).

Fit the bearing shaft (6) in the bearing housing (4), then fix the wire clamp (1) on the bearing shaft (6) by means of the [shear pin (s) (3)]. Lubricate the surfaces between bearing housing and wire clamp with grease. The bearing housing is then filled with grease before it is fitted on the wire weight by means of the tubular pin (5).

The shear pins should be replaced at regular intervals.

When the lifting tip (11) is led down in the core barrel head the latches are released from the latching ring. When the tip has passed the latches the inner tube is locked to the overshot, and the inner tube can be winched up by means of the wire.

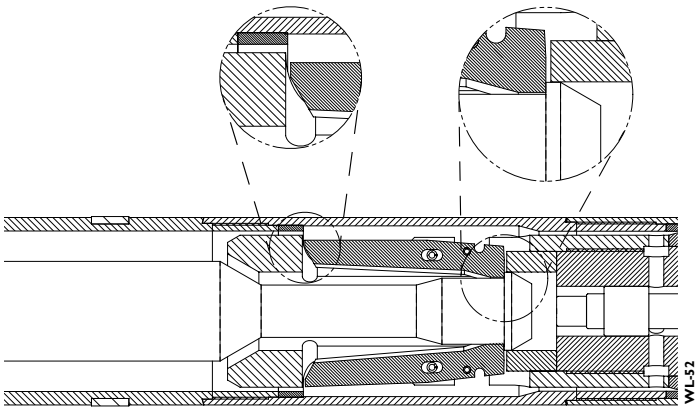


Figure 4. Core barrel head

Note

The lifting tip should be replaced when the edge of the lifting tip begins to be worn.

The lifting tip can if necessary be provided with a joint by fitting a ball joint (See Table 9) between the lifting tip (10) and wire weight (9).

7.1 List of spare parts - Free Falling Overshot 601 222 731

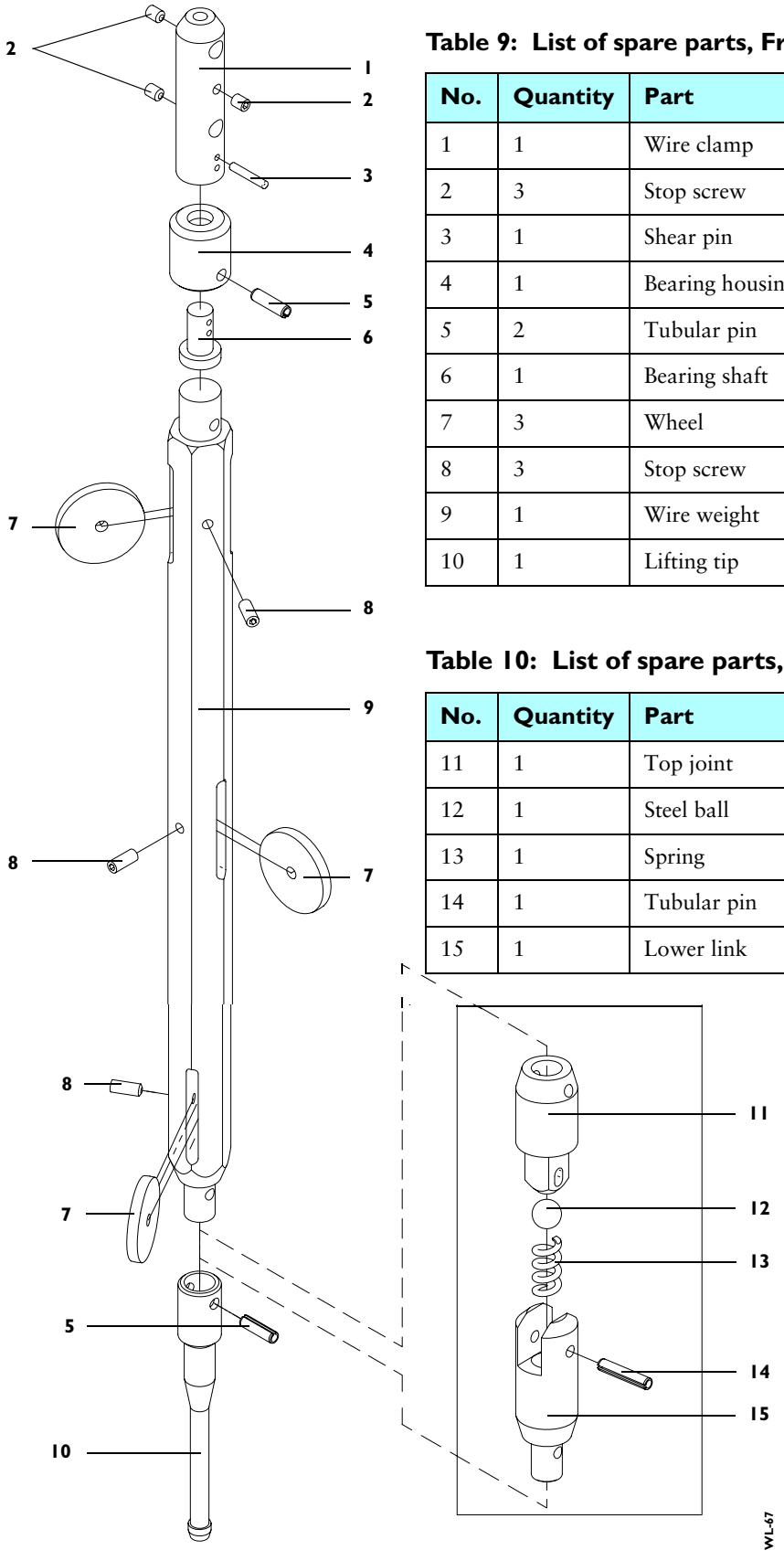


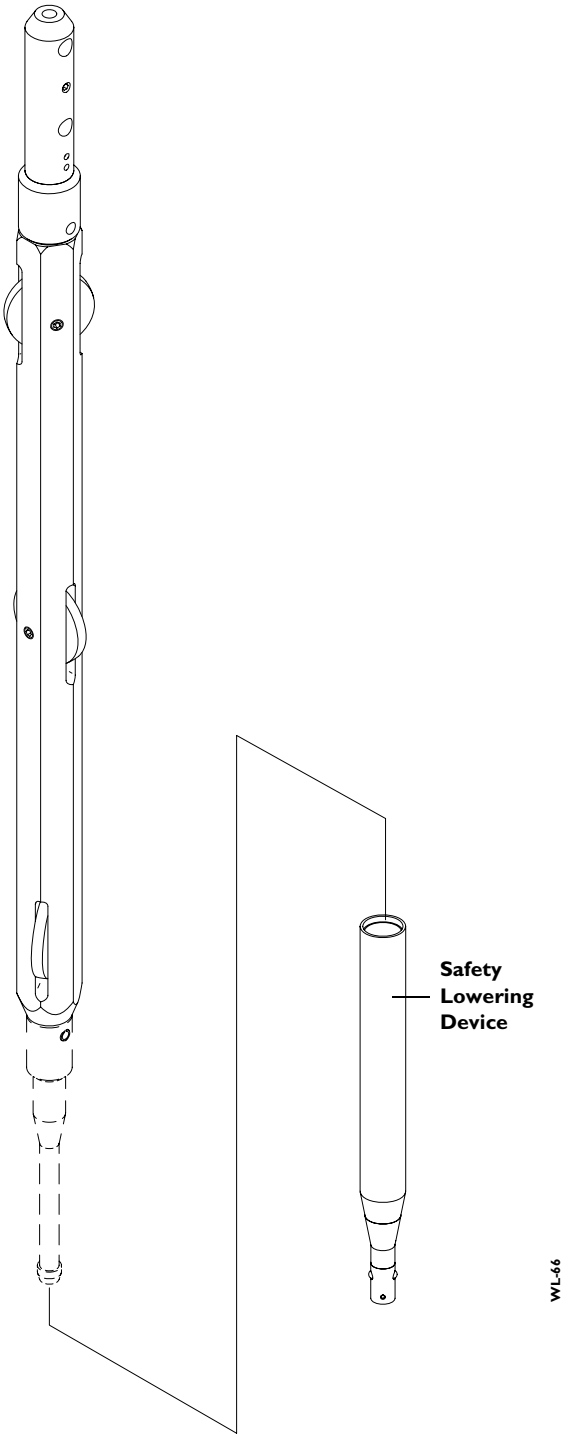
Table 9: List of spare parts, Free Falling Overshot, WL56/42

No.	Quantity	Part	Part no.
1	1	Wire clamp	601 222 692
2	3	Stop screw	300 027 148
3	1	Shear pin	300 025 423
4	1	Bearing housing	601 222 688
5	2	Tubular pin	300 015 732
6	1	Bearing shaft	601 222 693
7	3	Wheel	601 222 718
8	3	Stop screw	300 010 699
9	1	Wire weight	601 222 687
10	1	Lifting tip	601 222 217

Table 10: List of spare parts, Ball joint 601 222 462

No.	Quantity	Part	Part no.
11	1	Top joint	601 222 452
12	1	Steel ball	300 027 125
13	1	Spring	300 027 124
14	1	Tubular pin	300 015 949
15	1	Lower link	601 222 463

8. Safety Lowering Device for dry holes



For dry holes there is a safety lowering device, which is fitted on the standard overshot.

When the inner tube needs to be lowered into a dry hole, the lowering device for dry holes is fitted to the free falling overshot. The overshot is inserted into the core barrel head so that the balls (6) sit in the groove for the latches on the core barrel head.

The inner tube is winched down in the rod string and when the inner tube is in place, the latches lock as usual and the overshot can be disengaged and brought up.

Once the drilling is complete, the lowering device is detached from the overshot and the inner tube can be retrieved normally.

8.1 List of spare parts – Safety Lowering Device for dry holes 601 222 287

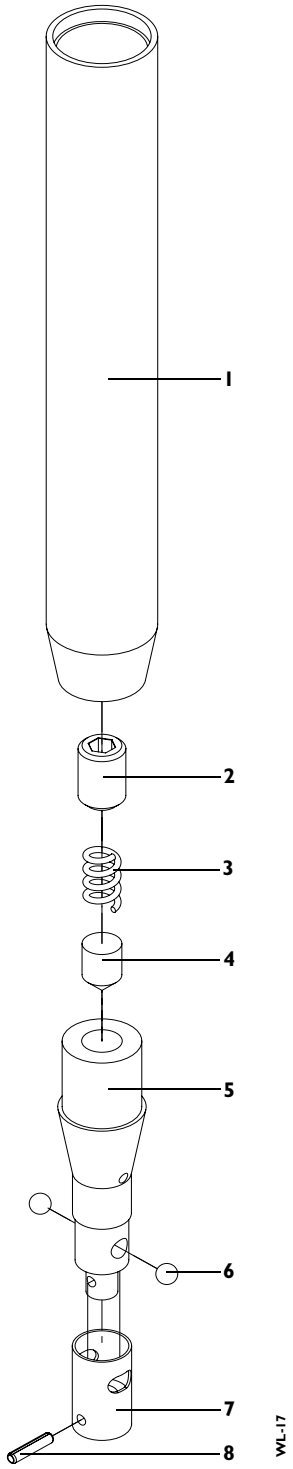
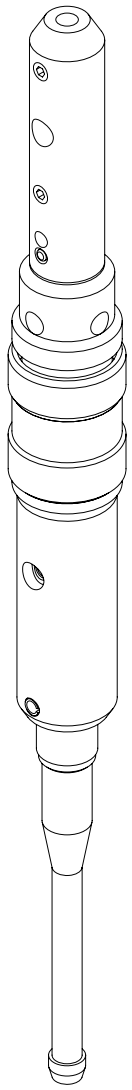


Table 11: List of spare parts, Safety Lowering Device

No.	Quantity	Part	Remarks	Part no.
1	1	Extension socket		601 222 251
2	1	Adjusting screw	SK6SS 12 x 20	300 021 311
3	1	Spring		300 021 312
4	1	Plunger		601 222 137
5	1	Spring housing		601 222 193-1
6	2	Steel ball		300 021 313
7	1	Hood		601 222 139
8	1	Tubular pin	FRP 3 x 14	300 027 261

9. Overshot for Pumping In



Overshot for pumping in has part no. 601 222 721.

The overshot has a swivel (1, 4, 5) in its upper end, which prevents the wire from twisting. A safety device [shear pin (3)] is built into the swivel and is intended to break at approx. 1.5 tons. This is to eliminate the risk of a cut wire being left in the hole.

Remark

When double shear pins are fitted the breaking point load increases to approx. 3 tons.

The wire is fitted in the wire clamp (1) and locked with three stop screws (2).

The bearing shaft (5) is fitted together with the bearing housing (4) and lubricated internally with grease. The bearing shaft is locked with a circlip (6). The shaft should be able to turn without problem, after which the wire clamp can be fitted by means of the shear pin(s).

The shear pins should be replaced at regular intervals.

The guide (8) and seal (7) are fitted on the valve housing (9), and the bearing housing (4) is tightened. The seal is self-adjusting.

The seal on the overshot for the pumping in seals to the drill rod. This means that a check should be made to see that the drill rods are free from rust on the inside and that no rod joints are damaged. Rusty or damaged rods will damage the seal.

The overshot is provided with a valve that opens automatically on recovery.

The O-rings (10) are fitted on the valve housing (9) and lubricated with a thin grease. The seal housing (12), spring (14) and shaft (15) are pressed together with the valve housing, and tubular pin (11) 8 x 28 is fitted.

Finally the lifting tip is fitted and locked with the tubular pin (13) 8 x 40. When the overshot lifting tip is inserted into the core barrel head, the latches will be released from the locking ring. Once the lifting tip has passed the latches, the inner tube is locked to the overshot and the inner tube can be winched up using the wire.

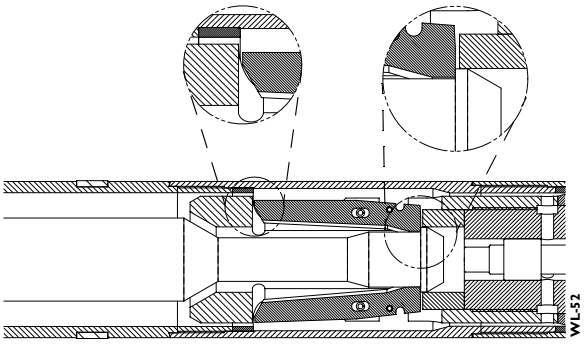


Figure 5. Core barrel head

Note

When the edge of the lifting tip begins to be worn it should be replaced.

9.1 List of spare parts – Overshot for Pumping In 601 222 721

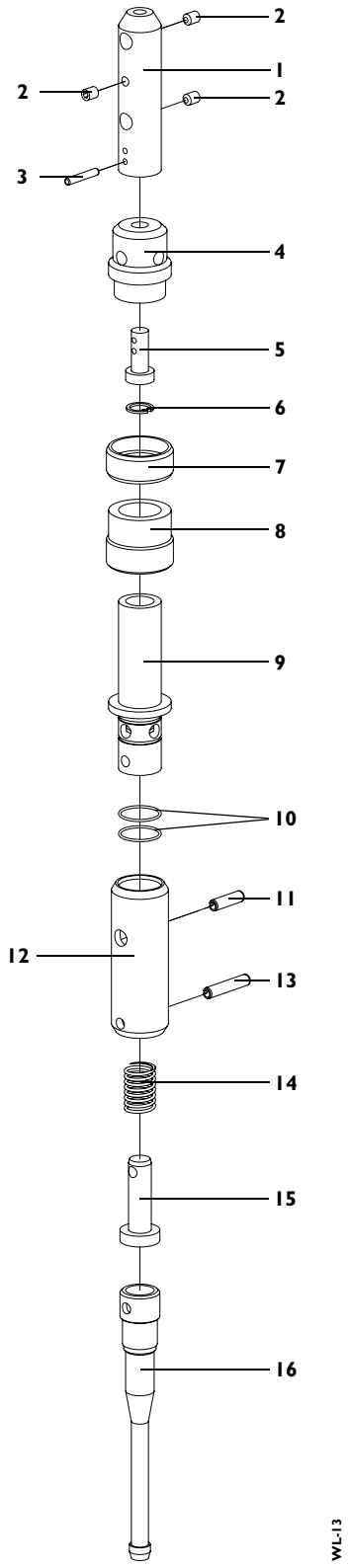
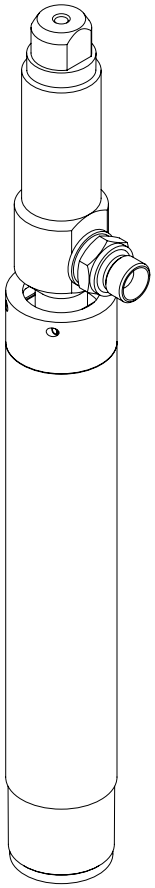


Table 12: List of spare parts, Overshot for Pumping In

No.	Quantity	Part	Remarks	Part no.
1	1	Wire clamp		601 222 729
2	3	Stop screw		300 027 148
3	1	Shear pin		300 025 423
4	1	Bearing housing		601 222 722
5	1	Bearing shaft		601 222 728
6	1	Circlip	SgH20	300 027 294
7	1	Sealing ring		601 222 723
8	1	Guide		601 222 724
9	1	Valve housing		601 222 725
10	2	O-ring	19.1 x 1.6	300 012 646
11	1	Tubular pin	8 x 28	300 015 732
12	1	Seal housing		601 222 726
13	1	Tubular pin	8 x 40	300 015 974
14	1	Spring		300 010 966
15	1	Shaft		601 222 727
16	1	Lifting tip		601 222 217

10. Stuffing Box



WL-14

Stuffing box has part no. 601 222 720-X.

The stuffing box can be fitted directly on the drill rod by screwing it on by with a pair of tongs.

We recommend that the sealing box, water hose, pump-in overshot and a 750 mm drill rod are fitted together to form a single unit, a “loading tube”. This simplifies handling when retrieving the inner tube. The loading tube can be screwed on the drill string by means of the machine as soon as the water swivel tube has been removed. The water is connected as per “Figure 6. Proposal for water handling” one page 22.

The stuffing box is designed so that the pipe string can be rotated during the pumping.

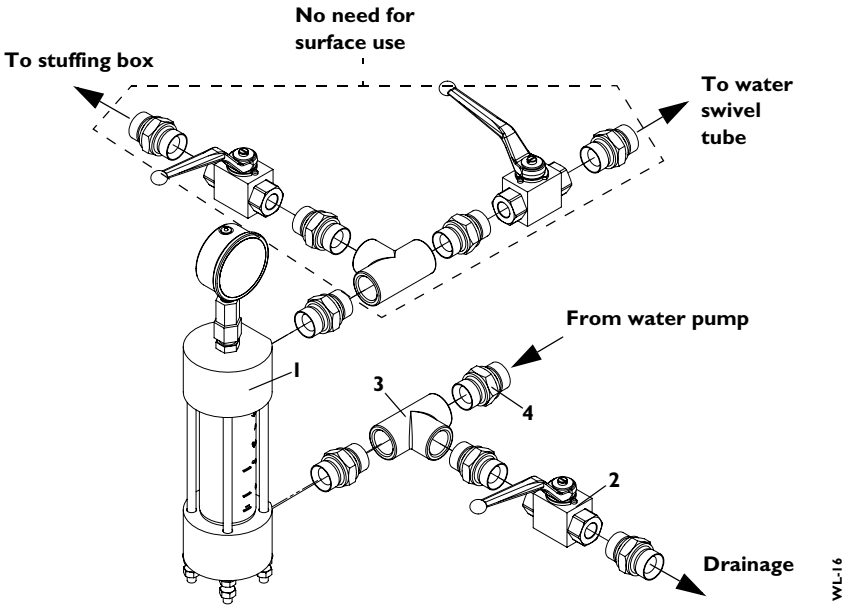


Figure 6. Proposal for water handling

Table 13: List of spare parts, Stuffing Box

No.	Quantity	Part	Remarks	Part no.
1	1			803 908 127
2	3		1/2"	300 013 227
3	2		3/4"-1/2"	300 013 056
4	6		1/2"-1/2"	300 013 048
5	3		1/2"	300 013 132

10.1 List of spare parts – Stuffing Box 601 222 -720-X, -866-X

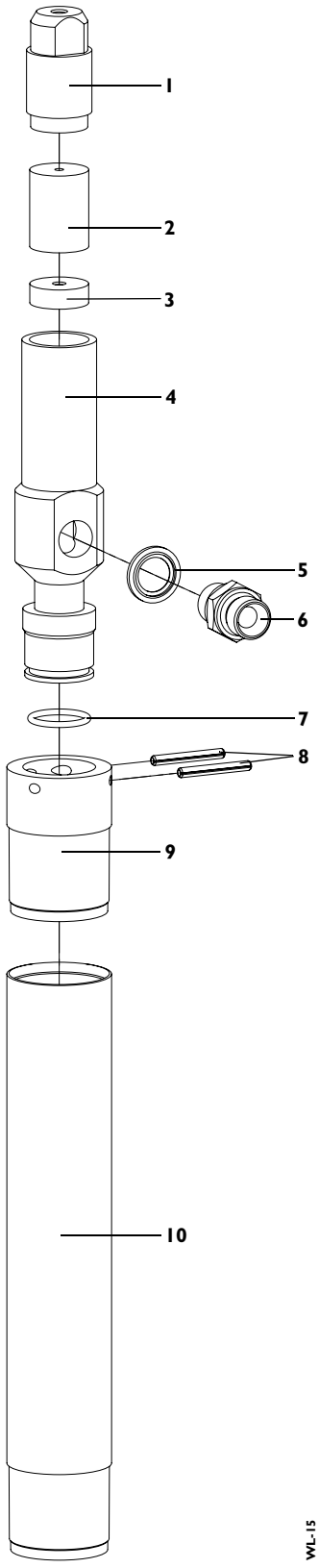


Table 14: List of spare parts, Stuffing Box

No.	Quantity	Part	Remarks	Part no.
1	1	Screw		See Table 15 on page 23
2	1	Seal		See Table 15 on page 23
3	1	Spacer		See Table 15 on page 23
4	1	Seal housing		601 222 635
5	1	Tredo washer		300 012 614
6	1	Adaptor		300 013 048
7	1	O-ring	29.2 x 3.0	300 012 691
8	2	Tubular pin	5 x 40	300 020 641
9	1	Connector		601 222 730
9.1	1	Connector	TH thread	601 222 867
10	1	Drill rod	L = 750 mm	601 222 733
10.1	1	Drill rod	TH thread L = 750 mm	601 222 856

Table 15: Stuffing Box, complete

Wire mm	Screw	Spacer	Seal	Stuffing box
4.4 (11/64")	601 222 638-1	601 222 637-1	601 222 499	601 222 720-1
4.8 (3/16")	601 222 638-2	601 222 637-2	601 222 501	601 222 720-2
6	601 222 638-3	601 222 637-3	601 222 543	601 222 720-3

Table 16: Stuffing Box, complete with TH thread 601 222 866-X

Wire mm	Screw	Spacer	Seal	Stuffing box
4.4 (11/64")	601 222 638-1	601 222 637-1	601 222 499	601 222 866-1
4.8 (3/16")	601 222 638-2	601 222 637-2	601 222 501	601 222 866-2
6	601 222 638-3	601 222 637-3	601 222 543	601 222 866-3

11. Wireline 56/42, Component Parts

Drill bit 56.5 - 41.2, Reaming shell 56.8, Drill rod 53.2 - 47.2 mm

Table 17: Wireline 56/42, Component parts

Component Parts	Part no.	Part no. TH thread
Core barrel, complete WL56/42 x 1500	601 222 746	601 222 862
Core barrel, complete WL56/42 x 3000	601 222 747	601 222 863
Core barrel, complete WL56/42 x 4500	601 222 736	601 222 864
Core barrel, complete WL56/42 x 6000	601 222 737	601 222 865
Outer tube, complete WL56/42 x 1500	601 222 738	601 222 858
Outer tube, complete WL56/42 x 3000	601 222 739	601 222 859
Outer tube, complete WL56/42 x 4500	601 222 740	601 222 860
Outer tube, complete WL56/42 x 6000	601 222 741	601 222 861
Inner tube, complete WL56/42 x 1500	601 222 742	
Inner tube, complete WL56/42 x 3000	601 222 743	
Inner tube, complete WL56/42 x 4500	601 222 744	
Inner tube, complete WL56/42 x 6000	601 222 745	
Core barrel head, complete WL56	601 222 714	
Core barrel head with shut off valve, complete WL 56	601 222 714-1	
Free falling overshot for downward hole, complete	601 222 731	
Ball joint, complete	601 222 462	
Lowering device for dry hole, complete	601 222 287	
Overshot for pumping in, complete	601 222 721	
Stuffing box for pumping in, complete	601 222 720-X	601 222 866-X
Water handling	803 908 128	
Water swivel	501 012 143-2	
Adapter, water swivel	501 222 813	601 222 888
Drill rod WL56/42, 53 x 750 mm	601 222 733	601 222 856
Drill rod WL56/42, 53 x 1500 mm	601 222 713	601 222 855
Drill rod WL56/42, 53 x 3000 mm	601 222 712	601 222 841

Component Parts	Part no.
Adapter drill rod WL53/47 pin x WL53/45 box	501 222 804
Adapter drill rod WL53/45 pin x WL53/47 box	501 222 803
Adapter drill rod WL53/47 box x WL43 pin	501 222 810
Adapter WL53/47 box x 42 pin	501 222 811
Adapter WL53/47 box x 50 pin	501 222 812
Adapter WL53/47 pin x WL43 box	501 222 813
Adapter WL53/47 pin x 42 box	501 222 814
Adapter WL53/47 pin x 50 box	501 222 815
Adapter drill rod WL53/47 TH pin x WL53/45 box	501 222 889
Adapter drill rod WL53/45 pin x WL53/47 TH box	501 222 890
Adapter drill rod WL53/47 TH box x WL43 pin	501 222 891
Adapter WL53/47 TH box x 42 pin	501 222 892
Adapter WL53/47 TH box x 50 pin	501 222 893
Adapter WL53/47 TH pin x WL43 box	501 222 894
Adapter WL53/47 TH pin x 42 box	501 222 895
Adapter WL53/47 TH pin x 50 box	501 222 896
Cuff wrench WL56 inner tube	501 115 047
Cuff wrench WL56 outer tube	501 115 048
Gripping pliers	501 115 035
Tool kit, including:	601 222 183
- Hex key 3.5 mm	
- Pin punch Ø4, Ø8 mm	
- Hook wrench Ø38, Ø58 mm	
- Sleeve NV 22 mm, connection 1/2"	
- Long screwdriver	
- Tool bag	
Wrench for inner tube connection	601 222 590-2
Assembly tool	601 222 484-2
Hand reamer for valve housing	300 025 325

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12. Recovery kit-Component Parts 501 217 116

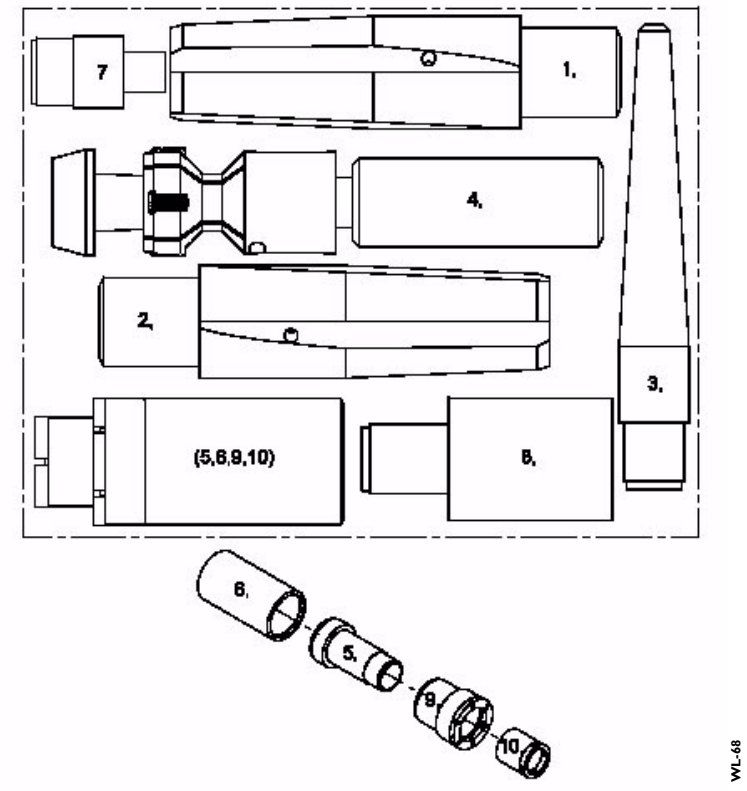

Table 18: Recovery kit 501 217 116

No.	Quantity	Part	Part no.
1	1	Drillrod tap WL53/47 RH connection 33.5 box	501 217 115
2	1	Drillrod tap WL53/47 LH connection 33.5 box	501 217 115-V
3	1	Drillrod tap Ø42 mm	501 217 001
4	1	Drillrod tap, expanded WL63	501 217 113
5	1	Extension tube recovery kit	501 217 101
6	1	Sub WL53 box x Z 56 box	501 217 098
7	1	Sub 29.5/27.5 pin x M24 x 1.5 pin	501 222 741-2
8	1	Sub WL53/47 box x 50 pin	501 222 812
9	1	Drill bit Z 56	100 011 782
10	1	Drill bit 34/23	100 024 583
11	1	Tool bag	300 027 167
12	1	Sub WL53/45 pin x WL53/47 box	501 222 803

13. Recovery Operation

Every core driller will sooner or later experience the situation when drilling tools are either broken down or stuck in the hole. In such cases no drilling can proceed before the string is recovered.

13.1 Reasons of breakage

13.1.1 Wear

Drill rods and other exposed parts of the drill string wear against the hole wall during drilling. The cuttings in combination with flush water will also contribute to this wear. The rods will wear down to a point where they will not be able to resist the torques nor the longitudinal forces they are exposed to.

13.1.2 Fatigue

Drill rods and drill bits are constantly exposed to heavy loads and forces. The life of the equipment is limited by its fatigue resistance. If the nominal life of the drill string is exceeded the risk of breakage is rapidly increased. The life can be considerably reduced if the through faulty usage or maintenance. Heavy deviation of the drill holes also reduces life of the drill string due to the combination rotation/bending.

13.1.3 Getting stuck

Common cause of getting stuck:

1. Poor evacuation of cuttings. The cuttings from the bottom of the hole has to be transported to the surface by means of flush water. Too low flush speed makes the cuttings pack up against the drill rods which ultimately will result in getting stuck.
2. Leakage of the drill rod joints makes the flushing of the lower part of the drill string insufficiently flushed.
3. Cracks and fractures in the rock may result in loss of flush water. Hence the cuttings will cease to move upwards and it will sediment in the hole.
4. Cracks may also cause the drill bit to get stuck during drilling.
5. Lack of flush water due to faulty water pump or operator error. The drill string will get stuck in a matter of seconds due to melting of the drill bit.

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13.2 First thing to do when...

13.2.1 ...drill string is broken (cut off) down the hole

The drill string still attached to the drill unit is taken out of the hole. The breaking point is studied and suitable method is then chosen to recover the drill rods still down in the hole.

13.2.2 ...core barrel or drill bit is so badly stuck that they can not be removed by the drill unit

The tools stuck in the hole can be drilled (cleaned) away with drill bits.

Swiveled parts stuck in the hole will rotate and therefore it may sometimes be nessesary to pour cement down the hole prior to the cleaning.

13.2.3 …the whole drill string is stuck in the hole due to sedimentation or cave in

It may be possible to save the drill string by drilling over it with a larger dimension.

13.2.4 ...tools have fallen into the hole

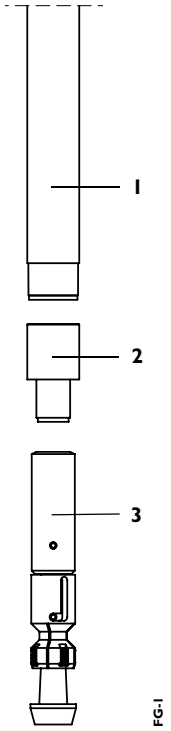
The two most common methods are to lower recovery tools — usually specially made for the specific purpose — or to drill away the tools.

13.2.5 …wire and hoses have snapped down the hole

It is usually possible to lower a ”spear” with hooks and rotate it. This will cause the hose/wire to twine around the spear.

14. Expanding recovery tap

The expanding recovery tap should be used if one of the drill rods is cut off in the hole. It is also an alternative when a drill string or parts of it is dropped down the hole and can not be “picked up” by remaining drill rods. The expanding recovery tap is a recovery tool for pulling up drill rods stuck in the hole *without rotation*. It should be not be used for unscrewing drill rods.

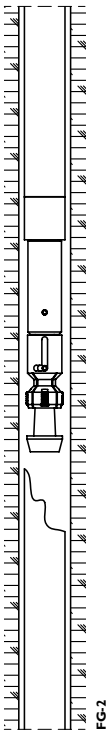


1. Assembly

The expanding recovery tap is attached to drill rods of the same dimension as the string stuck in the hole. An adaptor shall be used in between the drill rod and the expanding recovery tap.

Table 19: Expanding recovery tap parts

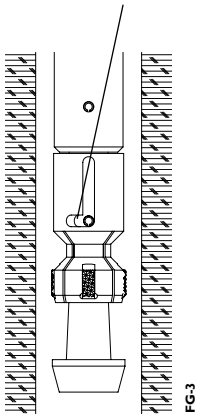
No.	Part
1	WL Drill rod
2	Sub
3	Expanding recovery tap



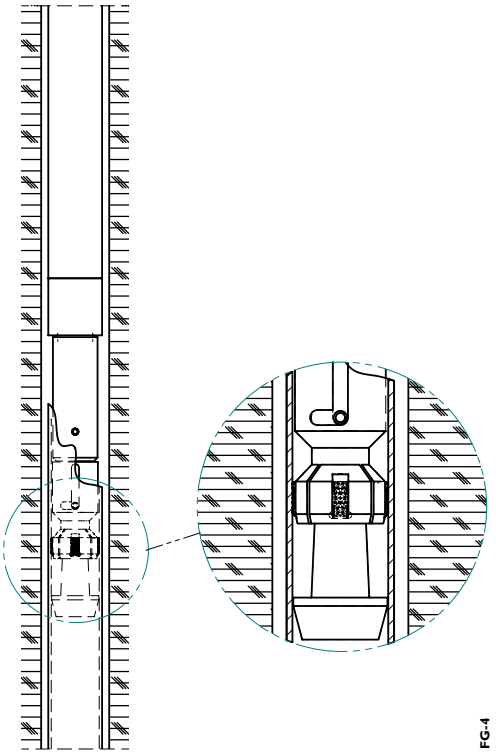
2. Lowering

Before the lowering of the tool, the expander should be fixed in “lowering position”.

The expander is turned until the steering pin is in a position which will enable the expander to move up and down.

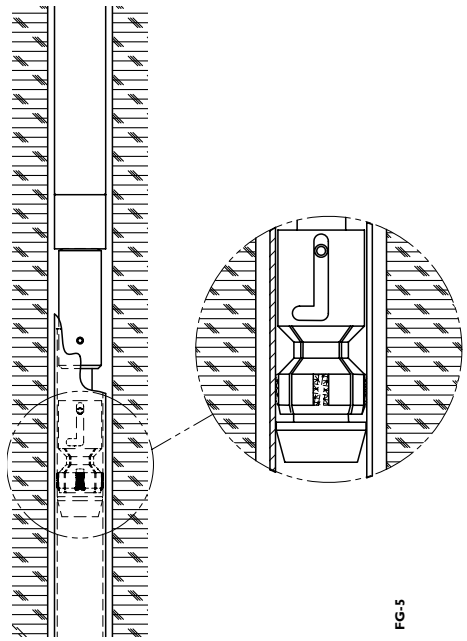


Lowering position



3. Lowering towards the “lost” drill rods

The expanding recovery tap is inserted a maximum of 250 mm into the “lost” drill string.



4. Recovery of the “lost” drill string

When the recovery tap shaft is being pulled backwards it will make the lower part expand inside the “lost” drill string.

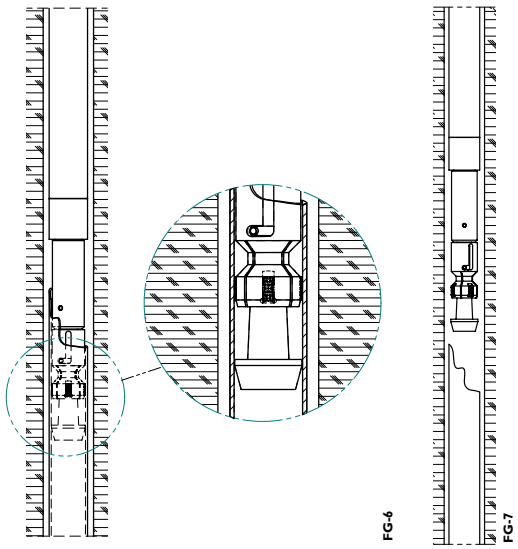
Table 20: Maximum pulling force without rotation

	WL46	WL56	WL66	WL76
Pulling force (kg)	8000	12000	20000	24000

Note

Do not rotate the drill string when the tool is being pulled back.

It may happen that the drill string is so badly stuck that the expander slides out of the drill string. In such a case another recovery tool should be used.

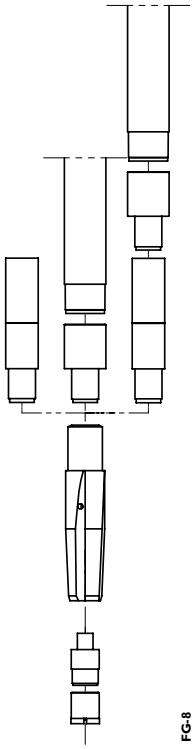


5. Release of the expanding recovery tap

If max allowed pulling force is reached, the expander should be released. This is done by pushing forward and turning the (fishing) drill string 30° RH-turn (see the picture to the left).

The expanding recovery tap can now be released and the next recovery alternative should be tried.

15. Recovery taps



The recovery tap should be used when a drill string is stuck or broken in the hole and when attempts to recover with the expanding recovery tap have failed. There are two types of recovery taps – one right hand threaded (RH) and one left hand threaded (LH). The right handed tap can be attached to three different set-ups of drill rods:

1. The existing drill string. With this set-up it is possible to screw the recovery tap only as far down the (stuck/broken) drill rod as the adaptor on top of the recovery tap permits. If the edge of the adaptor has reached the broken drill rod without the recovery tap gripping, another method of recovery must be used.
2. Using a smaller O.D. drill rod in between the existing drill string and the recovery tap. In this way the recovery tap is permitted to go deeper inside the (stuck/broken) rod.
3. Using a smaller O.D. drill string whose threads fit directly with the recovery tap.

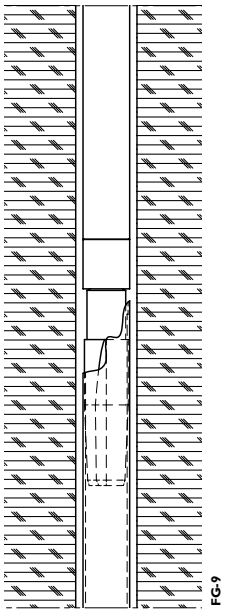
Table 21: Drill rod for the different systems

	WL46	WL56	WL66	WL76
Drill rod	33.5	33.5	50	50

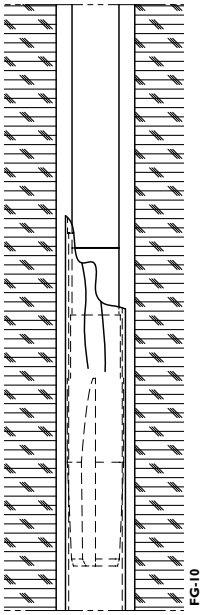
The RH recovery tap can be combined with a Z-cleaning bit to drill clean the hole from caved in rock.

The left handed (LH) tap is for recovering drill rods one by one when attempts to pull out the drill string have failed. These rods may not be stuck themselves, but joint with the drill rod or core barrel that is stuck deeper down in the hole. As the un-screwing is done with left hand rotation, the LH-tap requires a left hand (LH) threaded drill string. The LH tap can not be combined with the Z-cleaning bit that is included in the recovery kit.

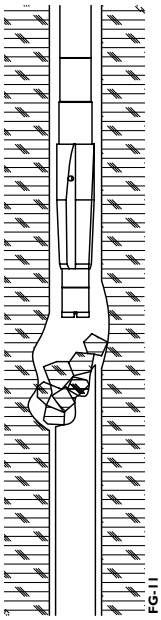
Alternative 1



Alternative 2 and 3

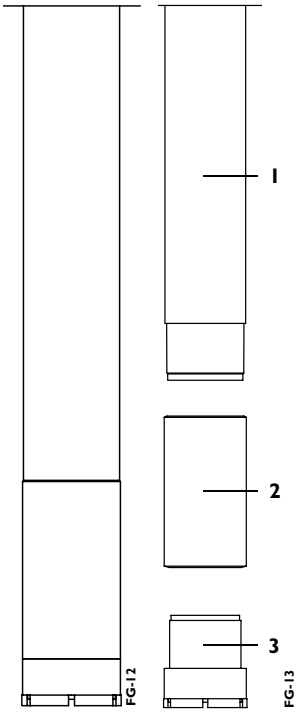


Recovery tap with Z-cleaning bit



16. Cleaning of drill hole

When tools are so badly stuck that they can not be recovered from the hole, a cleaning bit (Z) should be used to drill these tools away. In some cases it is necessary to pour cement in the hole to stop swivelled parts such as a core barrel head from rotating when the Z-bit is used.

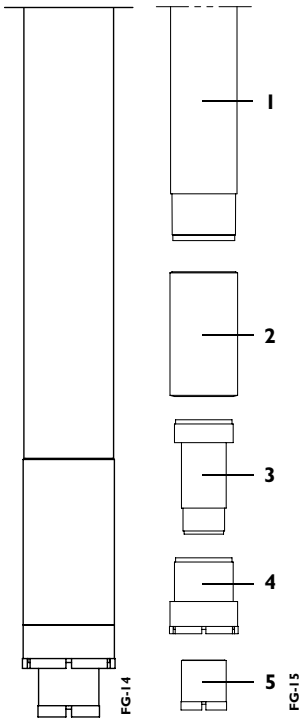


The cleaning bit is attached onto the WL drill rods by means of a sub.

If there is a problem with vibrations, there are specific drill rods (Z-drill rods) that can fitted directly on to the Z-bit.

Table 22: Cleaning of drill hole parts

No.	Part
1	WL-drill rod
2	Sub
3	Z-cleaning bit



The Z-cleaning bit can be combined with another drill bit if it becomes necessary to increase the cutting area to cut away the broken tools.

Table 23: Cleaning of drill hole parts

No.	Part
1	WL-drill rod
2	Sub
3	Extension rod for TV Z bit
4	Z cleaning bit
5	TV Z bit